(No Model.)

W. B. POTTER.

SAFETY APPLIANCE FOR ELECTRIC CARS.

No. 543,352. Patented July 23, 1895.

FIG. 1.

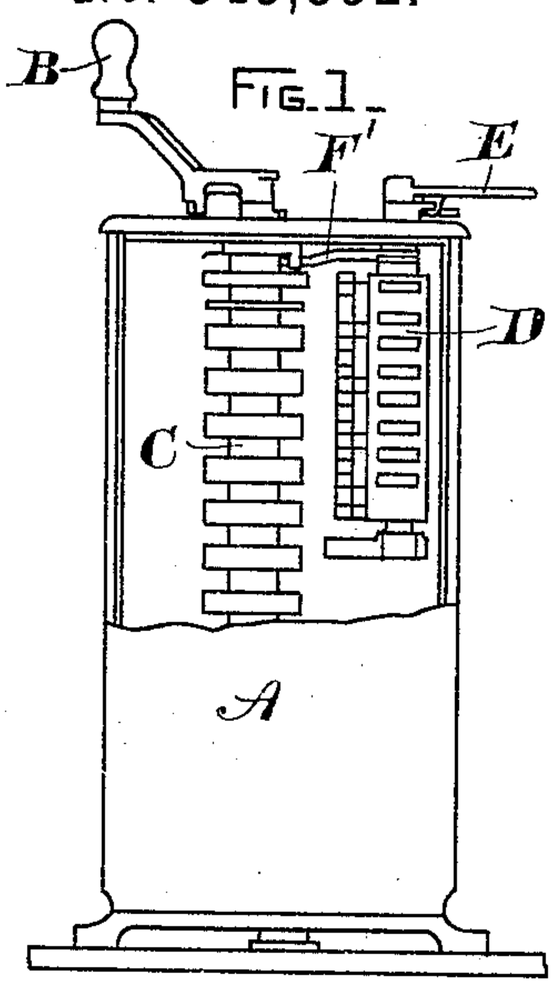


FIG. 2.

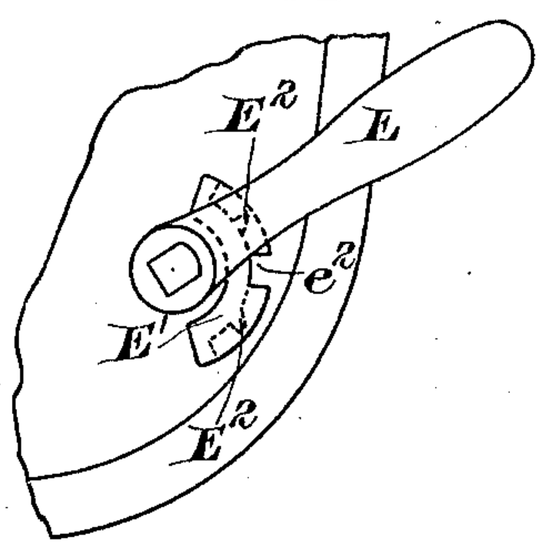


FIG. 3.

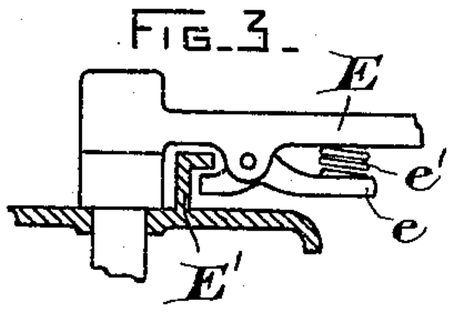


FIG. 4.

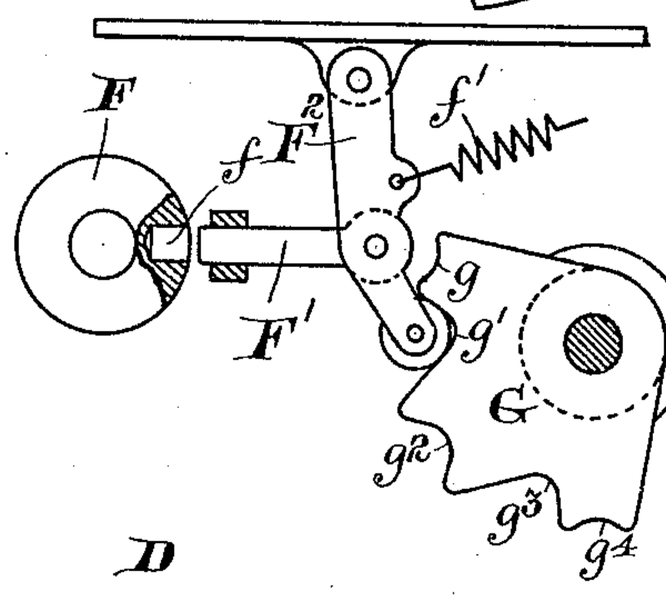


FIG. 5.

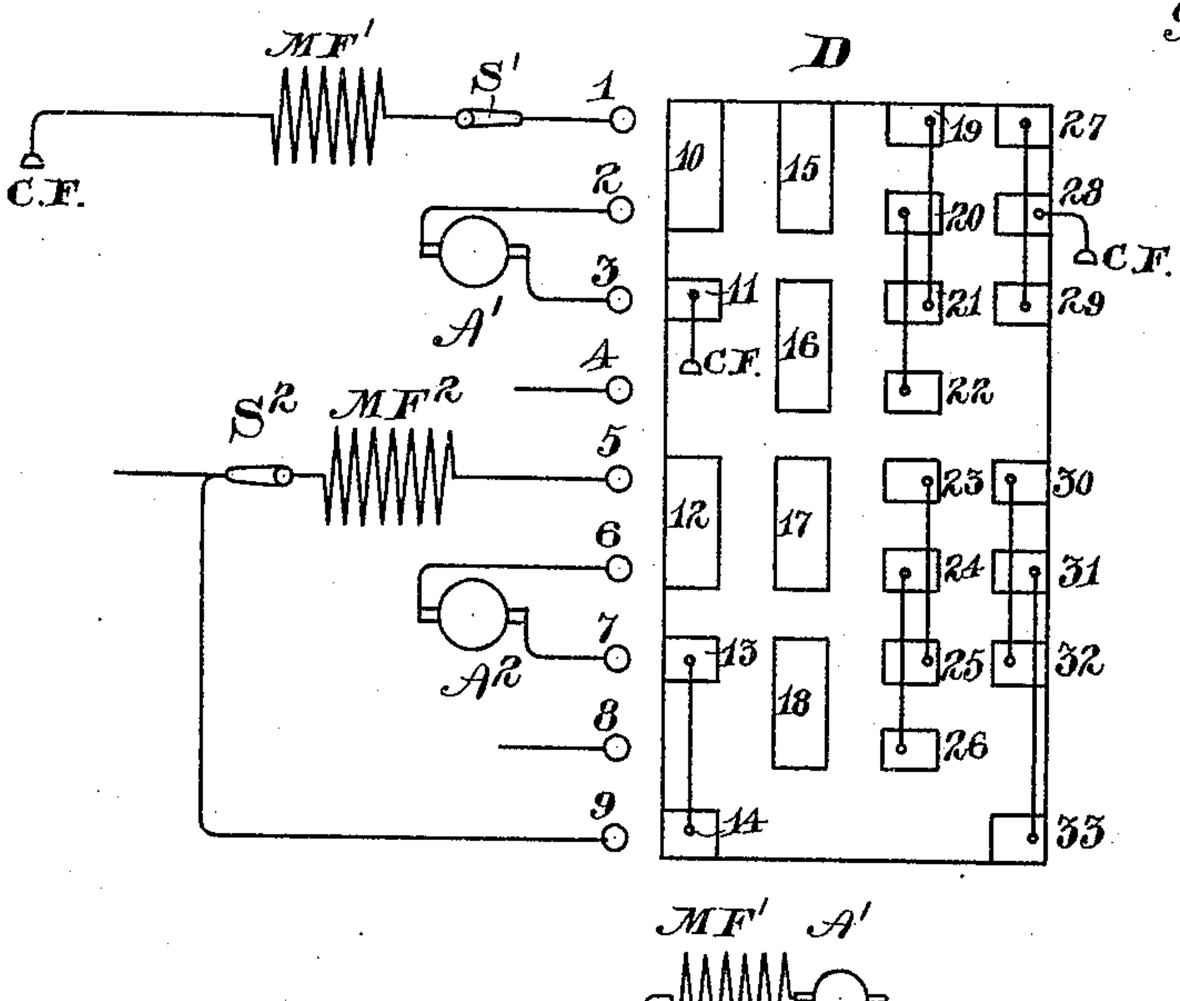
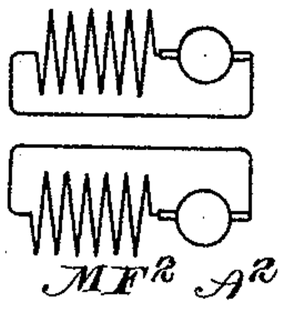


FIG. 6.



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SAFETY APPLIANCE FOR ELECTRIC CARS.

SPECIFICATION forming part of Letters Patent No. 543,352, dated July 23, 1895.

Application filed April 9, 1895. Serial No. 545,047. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Safety Appliances for Electric Cars, of which the following is a specification.

My invention relates to safety appliances for electric cars, and has for its object to provide a controller equipped with a reversing-switch having a certain additional series of contacts therein, by which I am enabled to stop the car within a very short space when any emergency demands that such a stop shall be made.

As ordinarily constructed, reversing-switches provide only for reversing the motion of the motors by means of the power of the trolley-current—that is to say, the switch has two positions, in the forward position the motor acting to propel the car in one direction, and in its backward position to propel it in the other. It has also been proposed to equip cars with electric brakes of one type or another, and to provide these brakes with stops of greater or less efficiency; but many forms of controller now upon the market are incapable of conversion economically into controllers equipped with electric-braking appliances, and in other cases it is impracticable commercially to equip the cars with electric brakes on account of the cost. It is for such cases that I have designed my improved emergency-stop. It is to be applied to the reversing-cylinder, and consists in two sets of contacts adapted to short-circuit the motors without resistance. I accomplish this by short-circuiting each motor upon itself independently. Where this precaution is not taken, it is impossible to apply the stop which I have devised to a car when running backward or when one of the motors is cut out, as if the motors be (as it is commonly called) "bucked" one against the other one acts as a generator to drive the other, and if one be open-circuited there is no braking action, while if both be rotated backward there is no resistance to the motion. This latter objection becomes of great importance in cases where a car is running uphill and the power suddenly fails, or the brake gives out, or for any other reason the car runs away backward. Under such circumstances, if my improved emergency stop be on the controller (it being entirely independent of the trolley-circuit) the car may be brought immediately to a standstill without the destructive racking which it must receive when such a stop is applied while the vehicle is running at the speed which it would attain while the motorman was going to the other end of the car to apply the stop on the brake there. It is of course not designed to utilize the emergency-stop as an electric brake in any sense, as the current generated is altogether too high for safety to the motors; but it is to be applied at times when the most important consideration is the stoppage of the car irrespective of any destructive results that may occur from the stopping, as when there is danger to life, either from persons on the track or from collision.

The accompanying drawings show embodiments of my invention, wherein—

Figure 1 is a front elevation of a controller equipped with my improved stop, with the cover partly broken away. Fig. 2 is a plan showing the handle and the detent therefor. Fig. 3 is a side elevation, partly in section, of the parts shown in Fig 2. Fig. 4 illustrates the interlock between the controlling and the reversing switch. Fig. 5 is a diagram showing the cylinder of the reversing-switch developed in plane. Fig. 6 is a diagram illustrating the motor conditions.

Referring by letter, A is the controller. C is the main controller-cylinder. B is the handle thereof. D′ is the reversing-switch, and E is its handle. The peculiarity of the reversing-switch, which is the only feature of novelty herein shown, is more fully illustrated in the drawings following Fig. 1.

In Fig. 2, E is the handle. E′ is the segment over which the handle moves, provided with the notch e^2 in its central position, which is the only one in which the handle may be removed. This is an old device commonly practiced. As my improved reversing-switch has, however, four positions, I provide two additional lugs upon the segment marked E^2 E^2. As will be observed, these lugs are bev-

eled upon one side only and have a radial surface upon the other. The object of this will be apparent from an inspection of Fig. 3. The ordinary lug projecting from the reversing-switch handle E is in this figure replaced by a latch *e*, working about a pivot and provided with a spring *e'*. From a comparison of the two figures it will be seen that the latch is free to pass the lugs E^2 E^2, but cannot return unless the motorman presses up the part against which the spring *e'* bears, so as to release it. The object of this provision is to prevent the lunge of the car throwing the motorman against the handle E with such force as to throw off the emergency-stop. Ordinarily it is applied by drawing the handle toward the motorman, as in the act of reversing the car. This will permit the latch, as just pointed out, to pass the lug E^2 nearest to the motorman; but when as the car stops (which it does with great suddenness) the operator is driven against the handle, yet the brake will not be thrown off until he is ready to permit it.

Referring to Fig. 4, I illustrate the details of the interlock between the controlling-cylinder and my improved reversing-switch. It is a modification of that shown in my Patent No. 524,396. The cam G co-operates with the pawl F^2, provided with the bolt F', registering with the notch *f* in a disk or collar F upon the shaft of the controller-cylinder. The cam is provided with notches *g* to g^4. When the cam-roller upon the pawl F^2 rests in either one of the notches *g' g*^{3}—in other words, in either the forward or the backward position—then the controller-cylinder may be rotated by the handle B; but when it rests in either of the other notches—that is, in the position corresponding to the notch e^2 upon the segment E', or when the handle is so that the latch *e* has passed either of the lugs E^2—then the bolt F' registers with the notch *f* and the controller-cylinder is locked against movement, thus preventing the accidental application of the power.

Referring now to Fig. 5, I illustrate the contacts and circuits of my improved safety appliance. I have numbered the fixed contacts or brushes 1 to 9 and the movable or rotating contacts 10 to 33. The contacts 15 to 26, inclusive, are those ordinarily found upon the reversing-switch cylinder of a two-motor controller, and therefore will not be further described. The armatures of the motors are lettered A' A^2 and the fields M F' M F^2. At C F, I have indicated diagrammatically the connections to the controller-frame which are illustrated and claimed in my pending application, Serial No. 535,430, filed January 19, 1895. S' S^2 are the cut-out switches for the respective motors. In ordinary use, with the brushes upon the series of contacts 15 to 18 the current would enter by the leads to the brushes 4 and 8 to the contacts 16 and 18, respectively, thence through the motor-armatures to the contacts 15 and 17, respectively, and out through the fields, going in one case to the controller-frame, which is grounded, and in the other case (depending upon the connections from the controller) either directly to ground or passing through the other motor; but when my improved stop is thrown on the current passes, in motor No. 1, from the armature to the brush 2, contact 10, then to brush 1, to the switch S', the motor field M F', and to the controller-frame, entering from the controller-frame to the contact 11, to brush 3 and back to the armature. In motor No. 2 it passes from the armature A^2 to the brush 6, contact 12, to brush 5, through the motor-field M F^2, switch S^2, brush 9, contact 14, cross-connected to contact 13, thence to brush 7, and back to the armature. The motors are thus each upon independent short-circuit, as shown in Fig. 6. With the car running in the other direction, however, the series of contact-plates 27 to 33 are brought into operation, and the circuit is: starting from the armature A^2 to brush 3, contact 29, cross-connected to contact 27, switch S', motor-field M F', controller-frame, from the controller-frame to contact 28, to brush 2, and back to armature. In motor No. 2, from armature A^2 to brush 7, contact 32, cross-connected to contact 30, brush 5, motor-field M F^2, switch S^2, brush 9, contact 33, cross-connected to contact 31, brush 6, and back to the armature. It will be seen that this arrangement brings the current through the motor-fields in the same direction in every case, this being a necessary feature, as the reversal of current in the field would demagnetize it and the motor would not act as a generator in the short circuit.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electrically propelled vehicle, a controller, and a cylindrical switch therein provided with four series of contacts, two of such series designed for the normal operation of the motors in running forward or backward, and the other two series arranged respectively to connect the motors each in an independent short circuit, the one series when running forward, the other when running backward.

2. In an electrically propelled vehicle, a controller, a plurality of motors operating the vehicle, and a switch in the controller provided with contacts and connections adapted to reverse the relation of armature and field in the motors and to throw them upon independent short circuits, in whichever direction the vehicle may be moving.

3. In an electrically propelled vehicle, a controller, one or more motors operating the vehicle, a switch co-operating with the controllers and adapted in its normal positions to determine the direction of motion of the vehicle, contacts upon the switch arranged to connect the motors each in an independent short circuit, the contacts being arranged in two series, one designed to operate in the forward

motion of the car, the other in its backward motion; and interlocking means between the controller and the switch, whereby the controller is free to move when the switch is in one or the other of its normal positions, and is locked against motion in its other positions.

4. In an electrically propelled vehicle, an auxiliary switch designed to act as a reversing switch in its normal operation, two series of contacts other than the reversing switch contacts carried thereon, such contacts adapted to short-circuit the motors upon a local circuit to act as an emergency stop, a handle for the auxiliary switch, and locking means for the handle so arranged that the handle may be thrown to the end of its stroke in either direction, but will be locked against accidental displacement after being thrown.

In witness whereof I have hereunto set my hand this 2d day of April, 1895.

WILLIAM B. POTTER.

Witnesses:
B. B. HULL,
A. F. MACDONALD.